

C. REMARKS / ARGUMENTS

Claims 1, 4, 5, 7-16, 18, and 20-22 are pending in the present application, of which claims 1 and 16 are independent.

Claims 1, 4, 5, 7, 8, and 15 have been rejected.

In this Amendment, claim 1 has been amended. No new matter has been added, as explained below.

Applicant respectfully requests reconsideration and allowance of the pending claims, in light of the foregoing amendments and the following remarks.

Claim Rejections – 35 USC § 102

Claims 1, 4, 5, 7, 8, and 15 stand rejected under 35 U.S.C. 102(e) as being anticipated by Alving *et al.* (U. S. Patent No. 6,594,339 B1, “Alving”). Applicant respectfully traverses this rejection, in view of the proposed amendment above and the discussion below.

Alving is different from the present application, in which control of x-ray exposure occurs during the x-ray exposure period itself (i.e. during the period of time in which the object is irradiated with x-rays in order for the x-ray image of the object to be generated)¹, and in which separate sensors are used for exposure control, as compared to x-ray imaging.

In the present application, exposure control occurs during first and second sampling intervals that occur within the x-ray exposure period itself, as explicitly recited in claim 1 (“...during a first sampling interval Δt_1 in the beginning of the x-ray exposure period during a second sampling interval Δt_2 within the same x-ray exposure period”) In contrast, in Alving the exposure control occurs prior to, and not during, the x-ray exposure period, as further explained below. Alving in fact relates to the “pre-pulse” method, which was described in paragraph [0007] of the present application as a known technique, and whose limitations are addressed by the present application.

In the present application, separate sensors are used for exposure control during the first and second sampling intervals, these sensors being separate and distinct from the x-ray detector used for x-ray imaging. See e.g. paragraphs [0015] and [0016] (“... The x-ray apparatus includes ... an x-ray imaging system ... for generating an image of the object from the received x-rays. The x-ray imaging system may be a radiographic film. Alternatively, the x-ray imaging system may include a digital radiography detector One or more sensors ... are provided for detecting x-rays ... during at least two sampling periods The sensors are disposed between the target object and the image plane of the object....”).

Claim 1 has been amended to specify that the x-ray apparatus includes an x-ray imaging system configured to receive x-rays that have been emitted from the x-ray source and have passed through the object, and that the sensors used during the sampling intervals Δt_1 and Δt_2 are disposed between the object and the x-ray imaging system. No new matter is introduced by these amendments, support for which can be found throughout the specification. See e.g. paragraph [0015], last three sentences; paragraph [0016], second sentence.

In contrast, in Alving the same X-ray detector is used for both exposure control and imaging, as further explained below.

Specifically, Alving fails to teach the following limitations in the rejected claims:

- #1 during a first sampling interval Δt_1 in the beginning of the x-ray exposure period, operating the x-ray source in the x-ray apparatus at said first operating voltage level kVp_0 , and
- #2 using one or more sensors to detect x-rays that have passed through a portion of the object during the interval Δt_1 , the sensors disposed between the object and the x-ray imaging system;
- #3 during a second sampling interval Δt_2 within the same x-ray exposure period ...operating the x-ray source of said x-ray apparatus at said second operating voltage level kVp_1 and
- #4 using said sensors to detect x-rays that have passed through a portion of the object during the interval Δt_2 .

¹ See e.g. last clause in part B of claim 1.

In contrast to limitations #1 and #3 above, in Alving exposure control does not occur during first and second sampling intervals Δt_1 and Δt_2 in the beginning of the x-ray exposure period itself, but rather during a “test exposure” that occurs before the actual x-ray exposure. See e.g. Alving Col. 8, line 49 (“After the test exposure, the X-ray exposure is performed”); see also FIG. 3 of Alving, in which the period T_p during which the test exposure is carried out is shown as being clearly separate and distinct from T_{exp} , during which the actual X-ray exposure is performed.² Alving therefore not only fails to teach or suggest limitations #1 and #3 above, but also teaches away from the subject matter recited in the limitations #1 and #3.

In contrast to limitations #2 and #4 above, in Alving no separate sensors are used during first and second sampling intervals, but rather the same X-ray detector (shown in FIG.1 as sensor matrix 20 with sensor elements 5, and described e.g. in Alving Col. 6:1-6) is used both for exposure control (during the period of time referred to in Alving as T_p or test period) as well as during the period of time referred to in Alving as T_{exp} (the actual x-ray exposure period for x-ray imaging). For example, Alving in Col. 6:lines 1-6 describes the X-ray detector and the forming of X-ray images thereon (“The X-ray image is formed on the X-ray detector The X-ray detector ... includes an X-ray sensitive solid state sensor matrix 20 with a large number of sensor elements 5”), whereas in Col. 7:45-47 and Col. 8:30-31 Alving describes the use of that same X-ray detector for exposure control during the test period (“X-rays having traversed the patient during the test exposure are incident on the X-ray detector, so that the X-ray detector produces the control signal”; “During the execution of the test exposure, the X-ray detector is read out, by way of the control signals”) Alving therefore not only fails to teach or suggest limitations #2 and #4 above, but also teaches away from the subject matter recited in the limitations #2 and #4.

Because Alving fails to teach or suggest at least the above-discussed limitations of rejected independent claim 1, Alving does not anticipate claim 1, nor does Alving anticipate claims 4, 5, 7, 8, and 15 (all of which depend on claim 1).

² See e.g. Alving Col. 7:38-40 and Alving Col. 8:49-52.

Allowable Subject Matter

Applicant notes with appreciation that Claims 16, 18 and 20-22 have been allowed.

Applicant notes with appreciation that claims 9-14 have been objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. For the reasons set forth above, the rejected base claim (1) has been amended, and is believed to be in allowable condition. Therefore, claims 9-14 have not been rewritten in independent form.

Conclusion

On the basis of the foregoing amendments, Applicant respectfully submits that all of the pending claims are in condition for allowance. An early and favorable action is therefore earnestly solicited. If there are any questions regarding these amendments and remarks, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,

/Elizabeth E. Kim/

Elizabeth E. Kim, Reg. No. 43,334
McDermott, Will & Emery
28 State Street
Boston, MA 02109
(617) 535-4411
(617) 535-3800

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